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QUERY.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

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SCIENCE

NEW YORK, NOVEMBER 24, 1893.

CURRENT NOTES ON ANTHROPOLOGY.—NO. XXXV.

(*Edited by D. G. Brinton, M. D., LL.D., D. Sc.*)

Census Bulletins Upon the Indian Tribes.

In these Notes, under date July 15, 1892, I called the attention of readers to the excellent work which was being done by the Eleventh Census in examining and reporting upon the present condition of the Indian tribes of the United States. The scope of the investigations was most properly extended beyond merely counting them, and embraced an inquiry into their modes of life, their physical condition, their progress in civilization and education, and generally into all those traits which make them a peculiar class in our nation, governed by separate laws, and treated by our government on principles adopted toward none other of the inhabitants of the land (Thank Heaven!).

This comprehensive investigation was placed under the charge of Expert Special Agent Thomas Donaldson, and ample evidence of the thorough and comprehensive manner in which he has completed his task is offered by two more Bulletins recently issued. One of these is on the "Eastern Band of Cherokees of North Carolina"; the other on the "Moqui Pueblo Indians of Arizona and the Pueblo Indians of New Mexico." They are both in large quarto, abundantly illustrated with photographs, maps, and drawings by excellent artists. The text contains a really surprising amount of newly-gleaned, accurate, uncolored information, covering the individual and ethnic life of these peoples, not too specialized, and yet not superficial. These Bulletins must always remain a first-hand authority for students of the aboriginal race of the United States.

Early Central-European Art.

In the year 1891 two interesting objects were found at remote points in central Europe, both of them dating from about the first century of the Christian era, and both illustrating in an attractive manner the art, and incidentally the life, of that little-known epoch.

One was a large vase of silver, dug up in a peat bog at Gundestrup, in Jutland, Denmark; the other, a bucket (situla), unearthed on the banks of the Danube, above Vienna, also of silver. The former has been made the subject of a handsome publication by the Royal Society of Northern Antiquaries, Copenhagen; and the other has been lately described in full by M. Salomon Reinach, in *L'Anthropologie*.

The Gundestrup vase is elaborately ornamented with numerous figures of gods and goddesses, men and women, horses, dogs and other animals, in répoussé, retouched on the outer surfaces. The eyes of some of the larger heads are of colored glass, fixed on pieces of metal. The scenes portrayed are of hunting, war and sacred rites. There is evidently a Gallic inspiration, as also one from classic art; but the archæologists of the Society reach the conclusion that this is a specimen of Danish skill in the first century.

The situla from the Danube is also adorned with figures in relief, representing a civic or sacred procession, combining a pugilistic exhibition, horse and chariot races, musicians, etc. It also presents certain traces of Gallic art, along with others which must be attributed to Etruscan influences, which we know at one time extended far north in Europe.

These two beautiful specimens have justly claimed the attention of the artists and archæologists of Europe.

The Nude in Science.

We have, from time to time, plenty of talk about the nude in art; its importance in science, anthropologic science, is just being discovered. For a recent and suggestive communication on this subject we have to thank M. Gabriel de Mortillet, the distinguished archæologist and ex-President of the Anthropological Society of Paris.

In a late communication to that Society he points out how many features are concealed by the clothing, and urges the value of photographs from the nude. He recommends that these should be taken in three positions—full face, in profile, and full back. It is essential that the same posture should always be maintained, and the best one is the subject standing erect, the legs together, the hands dropped by the side of the body. He also recommends that a man and a woman of the same family or locality be photographed standing side by side, so as to preserve and exhibit the distinctions of sex—though he does not overlook the difficulties in the way of accomplishing this, fortunately overcome, however, in a number of photogravures which accompany his report.

The physical anthropologist will at once see how much information can thus be added about a race or stock. We learn the hairiness of the body; the inclination of the shoulders; the relations of hip and chest dimensions in the two sexes; the development of the breasts in both sexes; the prominence of the chest; the projection of the gluteal region; the proportion of trunk to extremities, and a number of other physical peculiarities. It is to be hoped that this valuable suggestion can and will be carried out on a large scale.

The Criminal In Anthropology.

To the historian, to the philosophic student of man, morality and criminality become terms extremely relative—often convertible. What a people at one time regards as a revolting crime, the same people a little later, or another people at the same date, regards as innocent, or even praiseworthy. One has but to turn the leaves of such works as Dr. Post's "Grundriss der Ethnologischen Jurisprudenz," or Dr. Steinmetz's "Ethnologische Studien zur ersten Entwicklung der Strafe"—treatises combining solid erudition, sound judgment and enlightened views—to find examples by the hundred. Men and women with unusually high moral natures have generally been regarded as unusually depraved criminals by their contemporaries, and treated as such; for instance, Socrates,

Jesus, Hypatia, Bruno, Joan of Arc—the last mentioned burned, not as a captive, but as a sorceress.

Hence Mr. Arthur MacDonald, Specialist of the Bureau of Education on the Relations of Education to Crime, in his useful handbook just published by the Bureau, entitled "Abnormal Man," correctly defines such a man as one whose "mental or moral characteristics are so divergent from those of the ordinary person as to produce a pronounced moral or intellectual deviation." Any such deviation disturbs the bourgeois, offends good society, and brings upon itself the condemnation of the ministers of the law and the popular religion of a well-ordered community. The "abnormal men" include enthusiasts, reformers, men of genius, idiots and professed criminals. Mr. MacDonald deals with all these misgrowths with impartial hands, and presents a great and valuable mass of material for study about them, drawn from many writers on sociology and anthropology. His book is, therefore, an extremely useful contribution to our knowledge of these curious beings.

EXTENSION OF THE DAKOTA STOCK.

An interesting proof of the great value of linguistics in the study of ethnography is offered by the investigations of various observers into the extension of the Dakota or Siouan linguistic stock.

It was long supposed to be confined to the northwest, with an extension to the south among the Osages. The Mandans of the Missouri River spoke one of its dialects, and George Catlin, the artist, more than fifty years ago, expressed the opinion that they had migrated westward from the upper Ohio valley or farther east. But it was not until Mr. Horatio Hale, by an examination of the language of the tribe of Tuteloes, on the Roanoke River, in Virginia, proved that they spoke a clear dialect of the stock, that proof was at hand to show that portions of them lived in historic time on the Atlantic seaboard, and were encountered there by the doughty explorer, Captain John Smith.

There is some reason to believe that the Catawbas of the Carolinas are another branch; and in his late address before the Section of Anthropology of the American Association, Mr. James O. Dorsey offered evidence which places beyond doubt the supposition that the Biloxis, on the Gulf shore of Louisiana, are a colony of the same stock. He further advances the opinion, drawn from the nature of the linguistic changes which have taken place, that about 1,500 years have elapsed since these and the main body of the Dakotas severed their relations.

BIRDS WHICH SING ON THE NEST.

BY MORRIS GIBBS, KALAMAZOO, MICH.

AMONG birds, the females do not sing, and although many species have musical call-notes and agreeable tones in conversation, which are shared in by both sexes, still the true song is only rendered by the male bird. I am sincere in saying that the lady bird talks more than her mate about the house, but I will admit that when away from home she is very discreet in this respect. In attending to her duties of incubation she is very quiet, and it is seldom that a note is heard from her while on the nest. It has even been said that all birds are silent when incubating, so as to avoid observation. However, although most species are quiet when setting, there are a few which chirp loudly when so engaged, and some even burst into exuberant song.

Few observers are aware how assiduous are the attentions of the two birds to one another during incubation, and the credit which is due to the father-bird in his devotion in covering the eggs in his mate's absence is not allowed him.

Of course, when a bird is heard singing on the nest we know that the notes come from the male, but many young observers are inclined to attribute the song to the female. Another source of error in failing to identify the sex occurs with those species in which the singing male assumes the plumage of the female until the second or third year.

The chipping sparrow sometimes sings his chattering refrain while upon the eggs. Yellow warblers are not rarely heard singing from the nest, but one has to wait patiently in a neighboring copse, at the proper season, in order to hear, see and be convinced.

I have once heard the Maryland yellow-throat's song from its concealed nest in the grass; in fact, I found the nest, from hearing the peculiar notes, almost at my feet. Several times the song of the house wren has reached me, coming from the cavity where the old bird was sitting solacing himself in his gloomy nesting spot.

Once, each, I have heard the notes of the black-billed cuckoo, scarlet tanager, orchard oriole, goldfinch and the hermit thrush, the latter the only thrush whose song has positively reached me from the nest. One would think that the brown thrush, cat-bird and robin, as great singers, would burst forth on the nest, but it must be borne in mind that these thrushes all prefer higher perches for singing, while the hermit is a ground nester and often sings on the ground.

But of all the species which are musical while setting, the warbling vireo heads the list, both for persistence and for beauty of song, according to my note-book. Anyone can listen to the song of the warbling vireo on the nest if the trouble to find a nest with eggs in May or June is taken. For when the mate takes his trick keeping the eggs warm, he cheers himself, and enlivens the surroundings by pouring forth his rippling, inspiring melodious warble. I have heard him sing from the nest in early morning; in the hottest part of the day, and in the early twilight, and I have heard him issue as many as twenty bursts of song during one spell on the nest, and have discovered the nest on more than one occasion by the sweetly modulated tell-tale song.

These ten species are all the birds which I have found to sing while on the nest.

—The sixth annual meeting of the Geological Society of America will be called to order at 10 o'clock A. M. Wednesday, Dec. 27, in the Hall of the Boston Society of Natural History, corner of Boylston and Berkeley streets. Prof. William H. Niles, the President of the Natural History Society, will welcome the Geological Society. It is proposed to hold the sessions of Thursday at Harvard University, in Cambridge. Titles and abstracts of papers should be sent to the Secretary immediately, as it is desired to issue the list of papers not later than Dec. 12. Matter for the programme distributed at the first session must be in the Secretary's hands by noon of Tuesday, Dec. 26. Until Dec. 22, the address of the Secretary will be Rochester, after that date at The Thorndike, on Boylston street, Boston. Excellent facilities will be given for use of lantern illustrations. In place of the formal lecture on Wednesday evening, it is proposed to hold a regular session for reading of papers. Following an early adjournment there will be an opportunity for social introductions. On Thursday evening the annual dinner of the Society will be held, probably at The Thorndike. No special railroad rates are obtainable. "Holiday rates" are given during the week on some lines.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

CURRENT NOTES ON CHEMISTRY.—IV.

(Edited by Charles Platt, Ph.D., F. C. S.)

ADVANCE IN THE ANALYTICAL CHEMISTRY OF RECENT YEARS.

PROF. ALBERT B. PRESCOTT has outlined some of the most distinctive advances of analytical chemistry in a paper read before the World's Congress of Chemists. First we have "the resolute attempt to find out the composition of matter, as a whole, in any and all of its mixtures of whatever source." Complete analysis, proximate and ultimate, of complex substances has been entered upon, and "undetermined residues" have been made the beginning instead of the end of chemical research. The courage of analytical effort in recent years has been seen especially in the elaboration of methods for the isolation of carbon compounds, both natural and artificial. Proximate organic analysis has been called for by many practical workers, and we are now enriched by the labors of thousands in this field, which was opened largely by Dragendorff and Hoppe-Seyler. We have an increased knowledge of the molecular structure of bodies produced by nature—mineral, vegetable, and animal, as well as those of artificial production. Important advance has also been made in the employment of physical methods of inspection whereby molecular change is avoided. We have but to mention in this connection the multiplication of optical methods, the polarimeter, the refractometer, the spectroscope, recent studies in molecular mass, the freezing and melting points, solutions, adhesion and capillarity.

An exhibition of advance made is furthermore found in the reciprocal benefits of scientific research and of technical skill as seen in the work of experts in biological and pathological analysis, sanitary and forensic analysis, in the industries, and in agriculture and metallurgy.

SODIUM PEROXIDE IN ANALYSIS.

Probably no other recent addition to the reagents of the laboratory has become of such importance as has the peroxide of sodium, Na_2O_2. Its superiority as an oxidizing agent is firmly established, both because of its purity and because of its rapidity of action; and while but a few years ago it was something of a curiosity, it is now an article of commerce used in industrial operations, as well as in the finer applications of the laboratory. So long ago as 1871 Dr. John Clark pointed out, through the *Chemical News*, the strong oxidizing power of a mixture of caustic soda and calcined magnesia, and, a little later, illustrated the value of this action in the analysis of sulphides. As Dr. Clark states in a recent paper in the *Journal of the Chemical Society* (London), the exact cause of the above action was not quite clear at the time, but has since been determined by him to be due to the formation of the peroxides of sodium and magnesium. Hempel shows the superiority of the peroxide for the detection of chromium and manganese, and for rendering titaniferous iron ore soluble, but considers that for the oxidation of sulphur compounds that the addition of sodium carbonate is necessary to reduce the violence of the action. Clark, however, in the article referred to, prefers to use the peroxide without admixture with carbonate, stating that when a sufficiently low temperature is employed there is less tendency to loss by spurting and the action is completed in less time. In the analysis of pyrites, the procedure is as follows: One part, by weight, of the pyrites is mixed with six parts, by weight, of sodium peroxide in a platinum or nickel crucible, placed about two inches above a very low Bunsen flame. Oxidation immediately sets in and the mixture becomes red-hot. A few minutes suffices for the action, and upon its completion the sulphur is easily soluble in water. The solution is acidified and the sulphur precipitated as barium sulphate. In the case of blende part of the zinc dissolves with the sulphur, so that when it is desired to determine the zinc also the mixture is acidified with hydrochloric acid and precipitated with sodium carbonate before filtration. Galena, after treatment with peroxide, yields part of its lead into solution, and it is therefore advisable to acidify slightly with nitric acid and to boil with excess of sodium carbonate, when all the lead will be rendered insoluble, and upon filtration the whole of the sulphur will be found in the filtrate. By fusion with peroxide, arsenic is converted into soluble arsenate, and may then be estimated by any of the ordinary methods.

Dr. Clark uses peroxide of sodium most advantageously in the estimation of chromium and in the analysis of chrome ore. The temperature should not be so high as to liquefy the mixture, but just enough to form a paste, under which condition the contents of the crucible shrink, leaving a space between the mixture and the walls of the crucible. The mass is extracted with water and the solution boiled to decompose any excess of peroxide if the chromium is to be titrated. The insoluble residue dissolves easily in hydrochloric acid, and should be tested for any traces of undecomposed ore. The beauty and ease of this process can only be fully realized by analysts who have had practical experience with refractory chromium compounds. The analysis of ferro-chromium is conducted in the same manner, the metal being first reduced to a fine powder and then mixed with six times its weight of peroxide. This reagent is also applicable with some modifications in procedure to the quantitative estimation of chromium in steel, and in the quantitative separation of manganese from zinc, nickel and cobalt, the solution in this latter case being made in cold water, to avoid decomposition, which gradually sets in. In the separation of zinc and manganese, the latter is thrown down perfectly free from the former by the addition of peroxide to the ammoniacal liquid, or, as is recommended in the separation of manganese and cobalt, that the cobalt should be in the highest state of oxidation, the sodium peroxide may be added to the cold acid solution before rendering it alkaline with ammonia. In the separation of manganese from nickel and cobalt it is advisable to redissolve and to repeat the operation. Another valuable application of sodium peroxide is in the breaking down of tungsten minerals for analysis.

In a paper read before the British Association, at the Nottingham meeting, Dr. S. Rideal and Mr. H. J. Bult

propose the use of sodium peroxide as a substitute for alkaline permanganate in water analysis. It is hoped thereby to throw light upon the character of the organic nitrogen in the water by differentiation in comparison with the results obtained using potassium permanganate. With 1 gramme of the peroxide for 1-2 litre of water the total ammonia evolved equaled 0.027 parts per 100,000, while with the permanganate 0.050 parts per 100,000 were obtained. Repeating with the same water gave with the peroxide 0.026 parts, and with the permanganate 0.048 parts per 100,000.

The addition of a further quantity of sodium peroxide and further distillation failed to increase the amount of ammonia produced, hence it is evident that the peroxide does not break down certain of the nitrogenous contents, and it was found possible to obtain a fresh quantity of ammonia after the distillation with peroxide by adding the permanganate. Some of the results obtained were as follows:

Water.	Free NH_3	NH_3 by sodium peroxide.	NH_3 by potassium permanganate after the peroxide.
A,	0.01	trace	0.007
B,	0.001	0.004	0.011
C,	0.012	0.011	0.015
D,	0.021	0.024	0.057

Water.	Free NH_3	NH_3 by permanganate.
A,	0.01	0.008
B,	0.001	0.013
C,	0.012	0.027
D,	0.019	0.078

The sodium peroxide thus liberates a portion of the ammonia, and apparently this is included in that set free by potassium permanganate. There is evidently no ratio between the two, and hence we may have a means of differentiating. Wanklyn's method also indicates a differentiation of the nitrogen, but the problem is too complex to be of service. A water after being partially oxidized by the peroxide yields its nitrogen more quickly than water not so treated, and it is suggested that this is due to the partially oxidized nitrogenous substances being left in such a condition as to be readily broken up by the stronger reagent.

The Bacteriological Examination of Water.

According to C. E. Cassal, F. I. C., in a recent report abstracted in the *Chemical News*, the assertions that the bacteriological examination of water indicates its condition with relation to disease germs and that the analytical method gives the past history of a water rather than its present condition, are entirely devoid of foundation. "The so-called analytical method is the only one whereby a knowledge of the actual conditions of a water can at present be attained, whatever views may be held as to the degree of efficiency possessed by *any* method for arriving at an accurate knowledge of such condition." The bacteriological examination depends upon the successful cultivation of micro-organisms and their spores in a nutrient media, such as "nutrient gelatin" and meat broth, which may be carried out on a minute portion of a sample, and consequently can hardly be representative. The difficulties are in the method itself, in the small sample, in the particular treatment which is artificial and unlike the conditions of the body, and which, only if successful, gives some knowledge of the organisms present. Negative results are practically worthless. A further difficulty is the recognition of disease-producing germs as such when found.

Mr. Cassal is an extremist, but we have many such upon the opposite side, and undoubtedly we shall hear from them.

Nature of Red Phosphorus.

When exposed to the direct sunlight under water common phosphorus becomes covered with a red coating, and the same red modification is formed in abundance by heating in an atmosphere of CO_2, or other inert gas, to a temperature of between 235°–250°. The red variety is insoluble in carbon disulphid, undergoes no change in dry air, and may be heated to 250° without taking fire. The density is, furthermore, always superior to that of white phosphorus, though it is not constant, varying with the conditions of preparation. Commonly red phosphorous is spoken of as amorphous, and it was formerly so considered, but the error of this was shown by MM. Troost and Hautefeuille, who obtained a crystalline variety at 580° having a specific gravity of 2.34 (that obtained at 270° has a sp. gr. of 2.15). Mr. Hittorf had previously obtained a black crystalline variety by heating with lead to a red heat in a tube, without contact with air. After cooling, the lead is dissolved in dilute nitric acid and the crystallized phosphorus left as a residue. J. P. Cooke describes rhombohedral crystals of this substance.

The nature of red phosphorus has recently been under discussion in Germany. J. W. Retgers (*Zeitschrift fur anorganische chemie*) has made microscopic examinations in polarized light, and finds that the smallest and thinnest particles are distinctly transparent, though owing to their high index of refraction most of the light, with the exception of a central red glimmer, is internally reflected. When, however, the internal reflection is diminished by moistening with a highly refractive liquid, such as methylene iodide, the particles transmit a clear, ruby-colored light. In polarized light these show extinction in two mutually perpendicular planes, and they are consequently described by Retgers as crystalline, he considering the refractive power as too great to be accounted for by internal stress in an amorphous body. A few short prisms were observed, but the crystal system has not as yet been determined. Referring to the "metallic" phosphorus obtained by Hittorf, Retgers concludes that it is merely a better crystallized form of the red variety. The black color may be due to impurities, arsenic or lead. W. Muthmann criticises Retgers' article, and points out that red phosphorus is dimorphous, and that in the commercial product we have frequently a mixture of crystalline and amorphous forms. According to Muthmann, when phosphorus is heated in an atmosphere of CO_2 at 230° for 24 hours the product is principally amorphous, but is also crystalline in part. If the experiment is conducted in a glass tube the separation of the two is accomplished, as the amorphous variety sublimes and the crystalline does not. The sublimed portion has the optical properties of an amorphous substance. From the assumed greater purity of the sublimate it is argued that the presence of impurities, as for instance, arsenic, may favor the formation of crystals.

The Origin of Petroleum.

Among the papers presented in Chicago was one by Dr. C. Engler on the artificial production of petroleum, of both chemical and geological interest. Dr. Engler briefly reviews some of the better known of the various theories on this subject, as, for instance, that of Sokoloff, that petroleum was produced during the formation of our planet out of cosmical hydro-carbons, which, in the beginning, dissolved in the soft mass, separated from it later on. Mendeljeff assumes that water entering by fissures and chasms into the interior, comes into contact with melted carbide of iron, and produces by interchange oxide of iron and hydro-carbons of petroleum. The "distillation theory" is dismissed, for chemical and geological reasons—first, because it is difficult to conceive of the substance of plants being split up by distillation into petroleum with-

out leaving a residue of charcoal or coke, while in nature, according to Dr. Engler, we have no connection between doposits of coal and the occurrence of petroleum. Another theory, defended by Whitney, Hunt, Höfer and others, ascribes the origin of petroleum to animal remains. To test this latter theory, Dr. Engler has conducted a series of experiments so successful as to demonstrate clearly its possibility, at least, if not its probability, from a chemical point of view. First, some thousands of salt-water fishes were distilled under strong pressure, with the production of a liquid containing nitrogenous bases such as pyridin, but having no similarity to petroleum. Recalling experiments of Wetherill and Gregory as to the nature of so-called "adipocere," the idea was conceived that possibly in nature the nitrogenated animal substances were destroyed and the fatty residue converted into petroleum. Animal fat (train oil) was submitted to distillation under a pressure of 25 atmospheres at a moderate heat of 300°–400°, and it was found that 70 per cent (or 90 per cent of the theoretical) of the train oil was transformed into petroleum. The same results were obtained from the other fats like butter, hog fat, artificial fats, the free, fatty acids, etc. Not only illuminating oils were obtained, but also the lighter hydro-carbons, gasoline, ligwin, benzine, etc., and in those parts of the crude oil which show a high boiling point were found and separated paraffin wax and lubricating oils. "As a matter of fact," says Dr. Engler, "I have found in the distillate obtained by decomposition of train oil nearly all of the constituents which have been separated from the natural crude petroleum, and even the gases, which, like natural gas, consist essentially of marsh gas." For the chemism of the formation of the hydro-carbons, Dr. Engler refers to a recent paper in the *Berichte der Deutschen Chemischer Gesellschaft.*

RETICULATION OF SPINDLE-CELLED SARCOMA.

BY A. COWLEY MALLY, MUNSLOW, ENGLAND.

No subject lends itself more freely to errors of interpretation than the description of the microscopical appearances presented by histological and pathological preparations.

Even the delineation, both manual and photographic, of the structure of the Diatomaceæ bear some semblance of uniformity in the descriptions of different observers. Still, to quote Dallinger, "In the present state of the theory and practice of microscopy, it would be extremely unwise to give absolute adhesion to what is now held, by some students of diatom structure of no mean repute and of unrivalled manipulative skill, to be the absolute structure of some of the larger forms."

The same observation applies with still more force to the former investigations, as it is impossible to compare and correllate either the methods of preparation, observation or interpretation of different observers. They all differ, as a rule, in some detail, and in addition there is not only a marked tendency on the part of histologists and pathologists to copy the methods, drawings and results of others, but also a great liability to subjective imitation through suggestion.

Before confining myself to the evidences of reticulation in sarcomal structures, I may mention that the appearance in Polymyxa, so interpreted, is perfectly evident in some individuals and absolutely imperceptible in others. When seen, it is extremely evanescent, and, therefore, can scarcely be looked upon as evidence of the existence of formed material, but rather as the effect of some temporary chemical or physical change in or upon the external surface of the protoplasmic mass. The same or very similar appearances may be observed in Volvox, which are equally erratic, but as they are unquestionably received as the evidence of formed material, the foregoing statement is put forward as only a conditional hypothesis.

The portion of the tumor from which the accompanying sketch is taken was placed in Muller's fluid twelve hours before the sections were cut. These sections were taken from the central portion, where the fluid had evidently no time to act, then slightly stained with carmine, mounted in balsam and in the usual way. On being examined the same evening with a one-sixteenth water immersion and No. 12 compensating eyepiece, it was found that the markings forming portions of the reticulations took a definite direction, that is, obliquely lateral to the long diameter of the cell. This lateral obliquity did not change on revolution of the stage, and therefore cannot be interpreted as the result of oblique illumination. In many of the cells a granular nebular nucleus was observed, connected by slender and almost phantom branches with the oblique lateral markings. At the junction of these branches with the nucleus their point of

insertion or outgrowth, as the case may be, seemed to be placed in the hyaline substance surrounding the granules, and unconnected with the granules themselves. This latter observation is not laid down as an established fact, but simply as something more than ordinary conjecture. At the points of junction with the lateral markings there seemed to be definite nodal enlargements increasing in frequency towards the edges of the cell, and the whole section had a peculiar watered-silk appearance, which it was found impossible to represent on paper.

On examination of teased preparations, it was evident that the sections were cut obliquely, as the cells appeared very much elongated; at the same time they showed no reticulation.

Sections from the same portion of the growth were treated with osmic acid and several aniline dyes without effect. I am, however, by no means skeptical as to the results which ought to be obtained in perfectly fresh specimens with chloride of gold. Its manipulation is difficult, owing to the nature of the tissue, changes in temperature, light and color definition, therefore annoyingly variable in its results.

I cannot endorse Chatin's statement, as quoted by Dr. Stokes on p. 374, No. 517 of this journal, that reticulated structure in amœboides and in the blood corpuscles of

invertebrates is constantly and easily demonstrable. Chatin, in the previous paragraph, referred to osmic acid; it is natural to suppose that the organisms and globules were submitted to that treatment, a method which, at least in my hands, has proved extremely uncertain in its results.

In conclusion, allow me to request some of your very numerous correspondents to inform us if the spectroscope would give any material assistance in the solution of the true nature of these markings. (I, of course, mean the diffraction spectrum), my acquaintance with the instrument being limited to test fluids.

Since writing the above my colleague, W. F. Pentland, has persuaded me not to be too dogmatic with regard to the reticulation of the invertebrate corpuscles and individual (especially conjunctival) cells of invertebrates till after next spring, as in the meantime he intends working up the subject.

THE BACTERIOLOGICAL ANALYSIS OF WATER.

BY J. H. STOLLER, UNION COLLEGE, SCHENECTADY, N. Y.

WHEN, in 1881, Koch announced the gelatine culture method for bacteria devised by him, it was believed that one of its most important applications would be in the examination of waters with reference to their potable use. This method, as is now well known, renders possible an exact determination of the abundance of bacteria in water. But it was soon discovered that the mere demonstration of the presence of bacteria was of little value in estimating the qualities of waters, inasmuch as waters of unquestionable suitability for potable use often contained bacteria in considerable abundance. However, the general result was established that the numbers of bacteria are in relation to the amount of putrescible organic matter in the water.

The ideal value of the gelatine culture method not having been realized, it is probable that its true usefulness in water analysis has not been estimated as highly as it deserves. An experimenter who has familiarized himself with the distribution of bacterial life in waters will be able to form definite and reliable conclusions upon the basis of numbers of bacteria. This is especially true in the case of river water subject to polution by sewage from towns. Numerical determinations of abundance of bacteria having been made of samples taken at various points from the same river, a fair judgment may be formed of the amount of sewage polution at any required point. The first step requisite to be taken is to determine, for use as a standard, the numbers of bacteria in unpolluted water *in the stream under investigation.* Comparisons made with this standard give reliable quantitative indications of polution. Any access of sewage raises the number of bacteria above the normal for that stream and the excess is a definite indication of the extent to which the water has suffered polution. The standard is obtained by testing the water, both at such points and at such times as give the condition approaching nearest to purity for that stream. In general, samples taken from the head waters of the river, above the first town from which sewage polution is received, and at a time of continued fair weather when the water is free from rain-wash, are best suited for the control tests. In regard to the effects of surface washings from the land by rains, as indicated by turbidity of the water, it is necessary to eliminate them from all tests by taking samples only when the water is clear. This rule being observed, comparisons of results give indications of the extent of contamination due to sewage.

It should be added that there are other conditions which enter in a minor degree as factors in the results of numerical determinations of bacteria. These are temperature of water, depth at which the sample is taken, point at which the sample is taken with reference to rifts and pools in the stream, free exposure to air and light (prevented in winter by ice), etc. Consideration should always be given to these conditions and as far as possible samples should be taken under similar conditions throughout in order to render the results comparable.

The writer, working in association with Prof. C. C. Brown, consulting engineer for the New York State Board of Health, in furtherance of his work in investigating rivers as sources of water supply, has made numerical determinations of bacteria for some six hundred samples of water from the Hudson and Mohawk rivers. A statement of the results of this work is given in the annual reports of the State Board of Health of New York for the years 1891 and 1892.

It naturally occured to us, early in the work here alluded to, that a method of differentiating sewage bacteria from ordinary water bacteria would be of great value as affording a more exact means of ascertaining the degree of sewage pollution than is possible by the method outlined above. Dr. Theobald Smith, of Washington, D. C., was then consulting bacteriologist for the New York State Board of Health and upon submitting the idea to him he informed us of a method of differentiating gas-producing bacteria from others which he had devised and published some time previously (*Centralblatt fur Bakteriologie*, Vol. VII., p. 302 and Vol. XII., p. 367) and which he believed was applicable to the end sought by us.

The method thus placed at our disposal consists in the use of a culture fluid of which sugar (glucose) is a component and which is placed for inoculation in tubes similar in principle to the ureometer employed by chemists. Bacteria capable of causing sugar-fermentation when introduced into such culture-tubes give rise to a gas the quantity and composition of which can be ascertained. In the application of this method to the bacteriological analysis of water its value rests upon the fact that the most common species of bacteria present in feces are gas generators. As is well known the most constantly occuring species of bacteria in feces is *Bacillus coli commune;* and for some time our experiments related to the determination of the abundance of this species in the waters under investigation by means of the characteristic quantity and composition of the gases which it generates in the fermentation-tubes. Later others of the more common fecal bacteria were isolated and studied with reference to their gas-generating character. In this way a method was elaborated by which, it is believed, there can be determined with approximate exactness the numbers of prevailing species of fecal bacteria in a unit quantity of water. This determination is taken as a definite indication of the amount of sewage pollution.

In the practical use of this method the procedure is as follows: The saccharine culture fluid contained in a set, say eight, of fermentation-tubes is inoculated with a measured quantity of water from the source of supply under investigation. The tubes are immediately placed in an incubator and kept at a temperature of thirty-eight degrees centigrade for forty-eight hours or somewhat longer. (This is favorable to the development of fecal bacteria and probable destruction of the greater number of ordinary water bacteria.) Those tubes in which gas has been developed are then examined withreference to the amount and composition of the gases present and note is taken of those which agree in these respects with the effects produced by known fecal bacteria. Finally

upon these data the number of fecal bacteria per cubic centimetre in the water under examination is calculated.

A part of the results thus far obtained by the use of this method, together with a more detailed account of the method is published in the 1892 report of the State Board of Health of New York.

BRITISH STONE CIRCLES—V. OXFORDSHIRE, SHROPSHIRE, AND WELCH CIRCLES*.

BY A. L. LEWIS, F. C. A., LONDON, ENGLAND.

THERE is a well-known circle called the Roll-Rich, better known locally, however, as the "King-stones," four miles from Chipping Norton, Oxfordshire (Great Western Railway). It is 100 feet in diameter, and consists of fifty-four stones and fragments, varying from one to seven and a half feet in height, one to five and a half in width, and one to two in thickness. Many of these stand close together, giving the idea that the circle when complete may have been a continuous wall of enclosure; but this is a point on which the visitor can form his own opinion. Two hundred and fifty feet from the circle, in a direction 55° north of east, is a stone called the "Kingstone," 9½ feet high and from 1½ to 5 feet broad and thick; it is on the other side of the road which divides Oxfordshire from Warwickshire, and is therefore in the latter county. Though very similar in position to the "Friar's Heel" at Stonehenge, it would appear to be too far north to mark the point of sunrise; but it may have marked the point of the first appearance of light on the longest day. About 300 yards from this circle, in a direction 10° south of east, stand five stones called the "Five Knights," which are from eight to eleven feet in height and one to four in breadth and thickness. As they now stand they enclose a small square space, three of them standing in a contiguous line facing S. S. E., one standing four feet behind them, and the fifth forming the northeast side of the enclosure, but it is possible that the latter was originally a capstone on the top of the others, and has fallen into the position which it now occupies. The ground enclosed by these stones is two feet higher than that outside them; they may have been designed in connection with the circle, or they may not; this is a point for the consideration of the visitor. There is a monument very like the "Five Knights," some four miles south from Chipping Norton, at a place called Enstone. These stones are called the "Hoarstone," and are four miles from Charlbury Station (G. W. R.).

On a hill above Penmænmawr, on the north Welsh coast, there is a circle called "Y Meinen Hirion" (the long stones), eighty feet in diameter; seven stones from three to five and a half feet high remain upright, and one, eight feet long, lies prostrate; there are also sundry fragments and stumps. This monument, described in Gough's "Camden's Britannia" as one of the most remarkable in North Wales, is not unlike the Roll-Rich in character, but is smaller, and, as regards the circle itself, even insignificant. The ground toward the northeast falls rapidly away into a deep hollow, on the other side of which are lofty hills; but about 600 feet to the northeast, down in the valley, is a stone, now prostrate, nine feet long, five feet wide and two feet thick, and in the same direction, but about 400 further, is another prostrate stone of the same length and width, but twice as thick. These stones, placed like the "Friar's Heel" at Stonehenge and the "Kingstone" at the Roll-Rich, being down in a valley, do not themselves show up on the horizon against the rising sun, but they lead the eye directly to a hill on the other side of the valley, over the top of which the sun would probably rise on the longest day, as it is between 45 and 50 degrees east of north, and not very much higher than the circle. This hill, one on the north side of it, and the Great Orme, form a group of three, and we shall find that in the hilly districts of Great Britain triple summits or groups of three hills are often to be seen to the northeast of circles, from which it may be inferred that the circles were, for some reason or other, intentionally placed in such positions as to command views of triple summits in that direction.

There are two other circles which are only just over the border of Wales, in Shropshire, and are most conveniently reached from Minsterley, to which there is a railway from Shrewsbury. The farther and larger of the two is about seven miles from Minsterley, and is called Mitchellsfold; it seems to be slightly oval, the diameters being 86 and 92 feet; it consists of thirteen stones, varying from six to two feet in height, and one to three feet in thickness. There are also some fragments, but the original number of stones may have been from 27 to 30. Two hundred and fifty feet from the south side of the circle are two stones, fifty feet apart, the dimensions of which are from two to three feet each way; and half a mile due south was formerly a monument of some kind called the Whetstone, which may or may not have been planned in connection with the circle. The top of a high hill, called Stapeley Hill, is 50° east of north from the centre of Mitchellsfold (the same direction as the "Friar's Heel" at Stonehenge), and about three-quarters of a mile from it. Between the two is a single stone, now fallen, eight feet long. Still farther, in exactly the same line, on the other side of Stateley Hill, and at the same distance from its summit on the northeast as Mitchellsfold is on the southwest, is another circle, called the "Hoarstone," or Marshpool, circle; and beyond this, looking northeasterly, may be seen three low hills. The Hoarstone circle is about 74 feet in diameter, and consists of 33 stones and fragments, the general size of which is from two to three feet in height, width and thickness. The largest stone is in the middle of the circle, a little to the southwest of the centre, and is only three feet and a half high; but, as the ground is soft and swampy, the stones may be sunk to some depth in it, and their original height may have been greater, and, if so, the bottom of the central stone, which now leans to the southwest, may be nearly at the centre of the circle. Many of these stones have artificial holes in them; these are not ancient, but have been made by the miners, who fill them with powder and fire them when a wedding takes place in the neighborhood. Mitchellsfold, otherwise Madge's Pinfold or milking fold, is said to have received its name from a legend connecting it with a cow which gave milk enough for all honest people who wanted any, until some wicked person drew her milk into a sieve, from which time the cow disappeared. The fallen stone between the circle and Stapeley Hill is called the "Dun Cow," probably in connection with the same legend.

There is another circle on Penywern Hill, two miles south from Clun in Shropshire, but it is nearly destroyed; it appears to have been about thirty yards in diameter, and to have had an outlying stone ten feet high, 120 yards or so to the southeast†.

There is also a circle at Kerry Hill, in Montgomeryshire, eight or ten miles west of Clun, which, I am told, is about thirty feet in diameter, with a central block, like the Marshpool circle†.

*No. 1 Abury appeared in No. 529, March 24.
No. 2 Stonehenge appeared in No. 537, May 19.
No. 3 Derbyshire Circles appeared in No. 545, July 14.
No. 4 Somersetshire and Dorsetshire Circles appeared in No. 555, September 22.

†I have not seen either of these, and am indebted to Mr. Luff, a former resident of Clun, for the above information concerning them.

PELE'S FERNERY.

BY CHARLES FESSENDEN NICHOLS, M. D., BOSTON, MASS.

ONE Hawaiian morning, word was excitedly brought: "The cloud is off the pali and here are waiting Noo Loeloe (the Tired Lizard), Po Poki (Poor Pussy) and Wai Atlantika (the Atlantic Ocean), three merry natives all ready to climb the mountain, and why should not haoli (the outsider) join them? For it is but once in eleven years that Pele's cloud is off the pali.

Now who is Pele? And what is a pali? Any pali may become American soil and we ought to recognize it. The word simply means a high rock, or precipice, usually overhanging a mountain torrent; but Pele's pali, just here above the valley Waipio, enwrapped forever in the cloud which its great height attracts, is, with a considerable area of table-land, her own reserve. Superstition completely debars the natives from visiting this region; it is tabu ground,

"Death sure and swift awaits there,"

and nobody ever goes up to grope in the tangle of this beautiful cloud-garden of the very melodramatic goddess of Hawaii rei. To-day, however, so say these three natives, Pele withdraws her tabu. In compliment to the white haöli traveller, the secret-sacred, gray-fluffy cap, always hiding her white face* is, in part, removed.

Pele is the true ruler of Hawaii, not a queen or a princess to be bribed or pensioned dollarwise, goddess of infernal coquetry, of form so unstable that no idol has been fashioned for her worship, although she is held in such reverence as is given to no other, placable only when masquerading in some chaotic element, whose last footstep tossed molten lava, and who hides her rare garden where it finds its sunshine above the clouds.

Polypodium tameriscum, Hawaii.

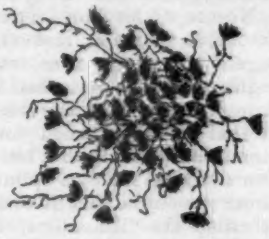
Realizing then, O Lizard, Pussy and Wai Atlantika! that your tales are ever highly colored and that eleven days would, most likely, generously span the time wherein your mountain has lately remained under water (even a fish-story must come to the surface to breathe before its eleventh year), realizing all this, it is pleasant to know that the wind has changed, her trade-wind no doubt; such good fortune is not to be slighted, and so we will together ride to the pali.

On unshod horses, lassoed from a neighboring rice-patch, we ride, with slight ascent, through long weeds and grass. Looking backward, the curious illusion prevails, often observed on an island, that the water below appears to rise and confront us, as if we were lower than the sea whose lustrous furrows seem no deeper than warped surface of polished mahogany.

Birds are seldom seen on these islands, yet we can hear much twittering, as if made by little hidden birds. These birds are never captured "and if we were to see one," says Wai Atlantika, "we should be drowned." A few hummingbirds are out to-day, and sand-mice, underground, make a noise between singing and chirping.

"Kauka" (Doctor), says Lizard, "it is time to be careful." Henceforth, at stated intervals, we dismount to place crisscross bunches (leis) of flowers and leaves, to propitiate the mountain deities (hoo-kupu).

Very safe it is to push aside the long weeds, seeking yams and ferns, for there are no snakes nor any other

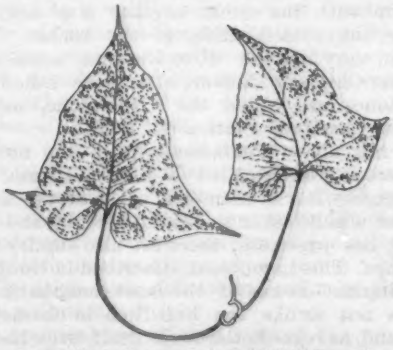


Trichomenes pervulum, Hawaii.

venomous reptilian life on beautiful Hawaii; very safe, while listening to the monotonous chant of my companions "Aloha lio loa" (praise to the big horse), to scoop the fingers through a brook for small fish, then eat them alive. The natives do not even chew their squirming captives!

"Kahuna," says Lizard (he means native doctor, witch-doctor, sorcerer, and now addresses the outsider as such by reason of our increasing friendship), "my mother buried five of us alive." "Why?" I ask. "To stop the volanco," replies Lizard.†

There is no trail. We pass cacti, sprawling in families like turtles, oval, ragged and dusty, some rampant and pugnacious, others on their backs. The hau tree (Hibiscus tilaceus), the banana, the ti (dracœna terminalis), begonias and yellow blooms of the shrub ohenaupaka (scævola glabra) are seen in a maze of trailers, fungi and mosses.



Polypodium spectrum, above Waipio, Hawaii.

Fragrant wood-strawberries grow here and we may eat them with the slippery, sour guavas found on all sides. A valley to the right is completely overspread by nasturtiums of enormous leafage and the smallest possible blossom. Somewhat pathetic it is, this growth, so many years after its wrinkled seeds were planted by some New England missionary, not quite content with palmetto, *ohia*,‡

*Pele is represented fair and flaxen-haired. Tradition of northern voyagers visiting these islands deified them, taking note of their light complexion. Captain Cook and his sailors were worshipped, at first, as gods.

†Even at this time the burial of living children is not unknown on Hawaii. The writer remembers an old woman, seamstress in a mission family, who was supposed to have eaten several of her own children.

‡Ohia, the native apple (Metrosideros polymorpha).

orange and fern! And now, without frost to interrupt their progress, the nasturtiums have filled in, from edge to edge, this untrodden vale; the mass of vines is from twenty to fifty feet in depth and extends as far as vision reaches.

Tired Lizard proves to be chief chatterer; he is small, alert, shows white teeth, rides backward and stops at times to braid his horse's mane. My other companions, of the common stolid type, I remember now, only by their legs, so long that the two men seemed to stand over their small horses and could walk at option without dismounting.

Ferns abound here and we may fancy their existence to be most joyous; knowing their right to the soil, sure that they are loved in all the land, for their beautiful life is not essential to the cruel worship of any evil god, they fill every nook or hang above us infested by big spiders. A loquacious Ophioglossum pendulum, embraced and festooned by a graceful piori (Smilax Sandwichiensis), attracts attention. But, without separate enumeration, we are aware of Blechnia Sadeleria cyatheoides, Davallia repens, with varieties of nephrodium, asplenium and pteris.

Gradually quitting firm land, our horses stumble at times, and sink to their chests in the mud; the weeds topple and flatten where a mountain stream gurgles; on one side lies a treacherous quicksand into which bullocks may sink and perish. Here we repeatedly dismount to cut the vines and roots which wind about the legs of the tired

Vittaria elongata, Hawaii.

horses. Ever pushing aside the thicket as we force our way, we are drenched by the water-laden branches of the tall shrubs; a dash, as if from a dipper, is thrown from tree or skirmishing cloudlet until our clothes drip as if we had waded through a river. 'Tis a sanatarium quite controlled by hydropathy. Warmth and reeking moisture are omnipresent; a height which in other lands would be the realm of snow attracts here only mists ever condensing into shower, and clarified by rainbow-sunshine. Under these conditions an enormous fernery is created where growths which could nowhere else mature revel undisturbed, unless the rarely veering wind stir for a moment the habitual quietude. Here the light clouds hesitate, touching the treetops, the soft wind bears no aroma but that of the mountain dews, earthy, evanescent, soothing. It is, indeed, the heart of the marvelously beautiful region to which we have aspired.

Ferns, where their life has full sway, inuade earth and air alike. Gleichenias travel, emulating the banyan and throwing out rootlets wherever their stalks touch the ground. Such as are parasites climb over one another, surmount the vast undergrowths, sway from tall trees and profit by their larger outlook—plagiarists and sycophants at very heart—to steal almost indiscriminately from the thousand forms outspread below. Again quitting their highest points of observation, charmed by the varied shapes which grow beneath, clinging and swinging downward, these marauders now steal the prettiest forms they spy. Polypodium spectrum outlines an oak leaf, Pteris decipiens miniatures the leaf of the rock maple, Polypodium tamariscum resembles the tamarind leaf, Vittaria elongata is indistinguishable from grass. Like the recognized imitation, or resemblance, on the part of certain birds, insects and many animals, of the leaves and trunks of the trees near which they dwell, these fern-counterfeiters often confuse the naturalist. The glass only detects fernship in many of the pretty parodists, revealing, on edge or surface of the leaves, their fine spores. Detection is often difficult (particularly in the case of Polypodium spectrum) except during the brief period of fruitage.

Tethering the horses, the natives now begin to place between thin pieces of wood the ferns we find. All will be fastened firmly together while the specimens are still fresh, before we go down the mountain. To collect ferns is to search, to shout, to be hungry, to wallow, to climb into far, wild places, until certain shy lives are, as it were, pressed into the service of science, receiving in captivity Latin names.

Polypodiums which, on the volcano, develop to fruitage in a few days, but are stunted, in the hot lava cracks, to a height of three or four inches, here exhibit long and graceful fronds. We find Polypodium pellucidum, P. pseudogrammaticus, and P. hymenophylloides, natives only at these islands. Pteris decora and Naratia Douglassi grow here only. The "Fanny fern" appears to be a hymenophyllum.* These, with many others, are found. An Asplenium enatum supports numerous young plants of its own variety which have enrooted themselves on the stems and leaves of the parent fern.

Wandering along the edge of the pali we see, on the low trees, charming pink shells. There are many varieties of these land-shells in the forests of the tropics, and a collection has been made and catalogued from Oahu, Maui and Hawaii.

The precipice drops, not very abruptly, about four hundred feet. Half way down, a great tree has fallen. Somewhat piteous and helpless the tree appears, devoured and ornamented by orchids, selaginellas, lycopodiums and pendant mosses, while every notch and gnarled limb supports parasitic ferns; among them are seen Trichomanes parvulum and the microscopically small Hymenophyllum lanceolatum, a pulpy mass with delicate projecting leaflets.

A giant pulu, the tree fern (Cibotium Chamissoi from which the natives gather the silky material with which they fill their beds),—this vigorous growth has forced upward an immense mass of earth upon which nestles the birdsnest fern (Asplenium nidus avis, throwing its vast leaves about as if to invite auks or phœnix to establish a nest here in Pele's service. It is now that Lizard wishes he could discover the secret cave of Umi, a great warrior said to be buried beneath this pali.

We look upward, seeking the little white rag which has been tied upon one of the horses for a beacon. A deluge of rain is pouring upon it from Pele's terrible forehead, signal for scramble, remounting and retreat.

Thus we saw her fair garden when the goddess was not at home; her soft cloud swept in and Pele's pali is but a memory, so intangible I could believe it a dream, were it not for my album.

*To Prof. Daniel C. Eaton, who kindly arranged my collections, I am indebted for the classification of these ferns.

MY NEW PRINCIPLES OF THE CLASSIFICATION OF THE HUMAN RACE.

BY G. SERGI, ROME, ITALY.

THE chief principle consists in discovering many varieties in man, as in animal species. These varieties have internal and external characters: the former are persistent and fixed by heredity, and in man are durable for many centuries—according to my own observations, more than a thousand years. The external characters are liable to be changed by crossing the varieties. These characters, now, are very much mingled in various ways, so that it is not easy to distinguish one from another. These mingled characters are constant causes of mistakes in the classification of human beings.

The internal characters of the human varieties are in the bony frame, especially in the skull; the externals are the color of the skin and of the hair and eyes.

Until the human classification is made by external characters (Linneus, Cuvier, etc.), we cannot have one upon a natural basis. Very little experience of the various races of man, as now classified, shows that these are an intermixture of various ethnic elements, with the same or various colors of skin, hair and eyes. Elsewhere we find various colors of skin with the same internal characters of the skeleton.

The skull chiefly furnishes the characters of classification; it shows the external shape of the brain, the most important and the highest organ of man; the skull is the means of the classification of the brain.

Now, I have discovered in the human skulls various forms or types which are persistent by heredity; these forms, which we find in many individuals, are varieties of my primitive ideal form of skull in human beings. Again, I have discovered that the varieties comprehend subvarieties by means of some new characters which modify the variety, or are superadded to the characters of the variety.

Therefore, I consider the shape of the skull as a natural basis of the classification of the varieties of man, because the varieties have a dependence upon a biological fact, viz., the natural formation by variations, as in animal species.

The various forms of the human skull have their origin from a series of anatomical facts: (1) From the various development of the bones of the human skull. (2) From the different curves of the bones, and from the different directions of these curves. (3) From the capacity of the skull.

It is true that anthropologists have often spoken of type of skull, but they have not defined this type; we can show it by the works of the German anthropologists, especially of Von Hölder, Ecker, Virchow, and others, of the French and Swiss anthropologists, as His and Rütimeyer, De Quatrefages and others. The Italian anthropologist, Mantegazza, has proposed a Linnean description of human skulls.

But all the anthropologists believe they can determine the form of the skulls by the measurements and the correlated indices.

This method of measurement, which Retzius introduced in anthropology, was suggested by himself and by subsequent scholars. Retzius classified the human races by means of the cephalic index, which is one character of the skull; he changed his classification four times in a few years, because his method was uncertain.

In my opinion, the method of measurements adopted for this classification is no method. The measures only discover some secondary characters of the skull; I have proved that, under the same cephalic index, we have many different forms of skulls, and under various cephalic indices we have the same shape of the skull. Besides, the skulls of all people of the world are dolicho, meco, and brachycephalic.

I think that Blumenbach laid the true basis of anthropology in his little book, *De generis humani varietate nativa*, a century ago. He found that the human varieties are numberless, and investigated very accurately the causes of the variations in man, as in animals. But subsequent anthropologists have left off the Blumenbach principles, which should have been the basis of systematic anthropology and of classification.

Now, my object is to establish the basis of systematic anthropology on the shape of the skulls, without regard to measurements. For this purpose it is necessary to find a nomenclature of those forms which correspond to the varieties and sub-varieties, as we have done in zoölogy. The nomenclature is intended to distinguish one form from another, and to fix definitively the forms of the different varieties. Further, the nomenclature applies to the geographical distribution of the varieties and serves to analyze the various ethnic elements which compose the peoples of the world. Thus we can follow the course of human emigration and of mixture in various times.

I have attempted, in many sketches, to show practically the results of my principles and of my new method of classification of varieties. These sketches are the following:

African and Armenian skulls: General considerations on anthropology and craniology. (Archivio per l'Antropologio, 1891). The human varieties in Melanesia (Academia de Medicina de Parma, 1892). The human varieties in Sicily (Acad. dei Lincei, Roma, 1892). The human varieties in Sicily. (Acad dei Lindei, Roma, 1892). The human varieties in Lower Russia (Anali de Medicina 1892). The primitive inhabitants of the Mediterranean Sea (not yet published). The microcephalic varieties and pygmies of Europe (Acad. di Medicina di Roma, 1893). Catalogue of the varieties of man in Russia. Systematic classification of the primitive inhabitants of European Russia.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as a proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

THE MECHANICS OF FLIGHT.

AT the recent Aërial Navigation Congress in Chicago a paper was read on this subject which was published in *Engineering News* for Oct. 12. The paper has caused a great deal of discussion, which has appeared in the same journal for Oct. 26 and Nov. 16. I think it will be of interest to readers of *Science*, who may not have access to this paper, to give a few points in these novel views and to show how valueless they are in explaining the perplexing problem of the soaring bird.

The author has made a careful study of the flight of buzzards in tropical regions, and assumes, as a premise, that because he has not seen the bird move its wings, or any portion of them, therefore it must gain some assistance from air currents. It seems to me this is a violent assumption at the outset; surely our eyes at a distance cannot give us movements of wings which might be ample to keep the bird at a level, or it may be that the bird does not continue absolutely at the same level, though appearing to the eye to do so. At all events, this premise should not be granted, and should be proved by evidence far better than any thus far adduced.

The author thinks that the bird in flying with a current and down an inclined plain will gain energy from the current over and above that due to the descent, and this

gain will enable the bird to turn and mount to a much higher plane than it formerly occupied. On the face of it I think this must strike every reader as extremely improbable and almost nonsensical. The opinion is strengthened as we continue on in the original discussion. Suppose a bird to be soaring at a speed of twenty miles per hour in a current which is itself moving at the same rate. It is very evident that this velocity must have been attained by the bird with almost no assistance from the air current, for the resistance of the air against the soaring bird it practically nothing. It is also evident that, if the bird continues soaring in this current, it must lose the velocity it had attained, and very quickly fall if not assisted in some way. If it descends in an inclined plane, its velocity, so far as the current of air goes, will not be changed in the least, for two reasons. First, it has the same velocity as the air current at starting on its downward path, and hence the air current could not accelerate it any more than if it had continued soaring in a horizontal plane. Second, as just suggested, the resistance of the air is practically nothing, so that the current will have no effect. The assumption that there is some occult assistance given to the bird, because it is going down an inclined plane instead of horizontally, will not be regarded as of any value by any one at all familiar with the simplest principles of mechanics.

But this is not all: an attempt is made to prove this occult assistance from a concrete example. The author takes a ship moving at twenty miles per hour and places upon it an inclined plane, whose vertical height is 13.38 feet, which is the distance through which an object must fall to attain a velocity of twenty miles per hour. Now, if a ball should be allowed to roll down this inclined plane, it would attain, so it is assumed, a velocity of forty miles per hour with respect to the water outside of the ship neglecting friction on the plane. This velocity of forty miles per hour is made up, as the author states, of the twenty miles per hour due to the motion of the ship or the initial velocity, and twenty miles per hour additional due to the acceleration from the fall of 13.38 feet in the descent of the ball on the inclined plane. It is perfectly plain that there is no occult effect coming in so far from the motion of the ship. The author shows that with a velocity of forty miles per hour, if the ball should roll upon an inclined plane fixed off the ship, it would rise to a point more than twenty-six feet higher than the starting point. This conclusion is quite startling, and shows a most serious fallacy in the reasoning. If the ball had rolled up an inclined plane fixed to the ship, it would have risen to exactly the same height as at starting, as was clearly shown by Prof. J. P. Church. That the ball would not rise to any such height will be clearly seen by considering what would happen if it rolled from its first position upon an inclined plane fixed upon the water. In this case it would rise exactly 13.38 feet, and its motion would cease altogether.

The vicious reasoning is brought out very clearly even in the original paper, for the author considers what would happen if the ball fell vertically instead of rolling down the inclined plane. In this case the twenty miles per hour initial velocity he considers as equivalent to a fall of 13.38 feet, and as the inclined plane is 13.38 feet high, the total fall would be equivalent to 26.76 feet, and he shows that with this fall the velocity attained would be 28.28 miles per hour. That is to say, a ball rolling down an inclined plane, where it must meet with a slight resistance, will attain an accelerated velocity of twenty miles per hour due to the fall of 13.38 feet; but, when the same ball falls vertically in free air, and where it meets with no resistance, its acceleration is only 8.28 miles per hour. I am sure nothing farther is needed to show the utter fallacy of all this reasoning. H. A. HAZEN.

Nov. 21.

PORTRAITS OF HELMHOLTZ.

I THINK it will be of interest to the many admirers of the distinguished physicist, Von Helmholtz, to know that on his recent visit to this country he was induced to sit for a photograph in the gallery of the well-known artist, Mr. Brady, of Washington.

Some most excellent pictures were obtained, copies of which may be obtained by addressing Mr. M. B. Brady, photographer, Washington, D. C.

The prices are: For the largest size, 9x14, $2.00; intermediate, 8x10, $1.00; cabinet, 25 cents.

The cabinet size and the others (*unmounted*) will be sent by mail. The larger sizes (mounted) must be sent by express, at the expense of the purchaser—usually 25 to 35 cents. T. C. MENDENHALL.

Washington, D. C., Nov. 7.

SONGS OF BIRDS.

HAD I not expected that we should have more satisfactory answers to the query as to whether the voices of birds expressed emotion or not, I should have ventured a word before now.

I think any student or observer of birds, who has carefully noted them with his heart in the study, will agree with me when I say that if there is such a thing as expression of emotion in voice, then bird voices most clearly express it. The mere fact that a bird soon forgot his loss and grief, and sang in the natural bouyancy of his spirits, or that another, lame and confined, was yet happy, and expressed his happiness in his song, certainly does not prove lack of emotional expression in the voices of birds.

The untrained ear may fail to detect the difference in the joyful and sorrowful notes of some birds, but surely the ear must be indifferent, indeed, that does not detect plain expression of sentiment or of joy in the happy song, or of sorrow in the disturbed wail of any of the common birds about our doors.

The gift of voice was unquestionably intended as a means of expression to all creatures thus endowed, and wherever our powers of comprehension enable us to hear and understand them aright, we cannot fail to detect expression in them.

This may seem a trivial matter to bring up at this time, but it seems hardly fair that we should pass over the matter without giving to birds and all other creatures their just dues. B. S. BOWDISH.

Phelps, N. Y., Nov. 1, 1893.

DICTIONARY OF SCIENTIFIC NAMES.

THROUGH your query column, permit me to ask if there has ever been published a pronouncing dictionary of scientific names in use in the study of natural science for the benefit of the young student who does not care to delve too deeply into the study of Latin, and if not, why would not such a publication be a welcome addition to our library? B. S. BOWDISH.

Phelps, N. Y., Nov. 9, 1893.

ORIGIN OF THE CARVINGS AND DESIGNS OF THE ALASKANS AND VANCOUVRE INDIANS.

A FEW years ago I crossed the ocean on a slow steamer in company with a returning missionary, who had spent fourteen years among the Vancouvre Indians. He had with him a large collection of carved implements and *fac simile* drawings of the quaint figures on their boats and other objects. His opinion was that they were Japanese in design; that at some time some people from that country had been blown across the Pacific, and left there traces of their arts, which were perpetuated. He thought there were some traditions among the Indians that pointed that way also.

In looking over the collections at the Exposition this

summer it occurred to me to verify his conclusions.

In the Anthropological Building was a large collection of "totem poles," carved implements, and drawn figures from Alaska, also from California, Mexico, Central America, and Peru, as well as from other parts of the Americas. In many places Japan was largely represented.

There is a most striking difference between the arts of the western coast and the interior of America. They have something of the grotesqueness of Japan, but not much other likeness. They are akin to those of ancient Mexico, and would indicate that the arts and the people of the western coast were of like origin; that the "totems" and other figures of Alaska and Vancouvre are survivals of the arts of Central America and ancient Mexico.

P. J. FARNSWORTH.

Clinton, Iowa, Nov. 12, 1893.

ON THE SYSTEMATIC POSITION OF THE DIPTERA.

AS A student of diptera, I have been interested in the recent letters by Professors Packard, Smith and Riley in *Science*, on the systematic position of this order of insects, and wish to express my entire concurrence in the views presented by these gentlemen. That the diptera, or some of them, are the most specialized of insects—that they depart most from the primitive type of insects—seems to be almost without argument; but that they therefore hold the highest position among insects by no means follows. Even the advocates of the supreme rank of the order have never ventured to carry their conclusions to the logical ultimatum, and give to the sheep-tick, or, better yet, the wingless, eyeless bat-tick, the highest rank. That the bat-tick is the most specialized among diptera admits of no question; that it is one of the most degraded of flies is equally certain. The whale and the bat are more highly specialized animals than is the dog; but, nevertheless, they have a very inferior rank.

I have collected flies for years, and have necessarily observed their habits somewhat closely, but I have never seen anything in them that might be called intelligence. Man's claims to preëminence in the animal kingdom rest almost wholly upon his intelligence: for the same reason, preëminence among insects must be conceded to the hymenoptera.

S. W. WILLISTON.

BOOK-REVIEWS.

Lecons de Chimie, a l'usage des Eleves de Mathematiques speciales. Par HENRI GAUTIER, ET GEORGES CHARPY. Paris, Gauthier-Villars et fils, Quai des Grands-Augustins 55 471p., Ill., 1892, 9Fr.

WE take pleasure in announcing to students of chemistry in this country the above able work of MM. Gautier and Charpy, which while designed, according to its title, particularly for students of mathematics is of highest interest to all chemists. The title is misleading to American readers as the book is in no sense a volume of difficult and complex mathematical theories as one might suppose but an extraordinarily clear exposition of the ground work or base of chemical science, mathematical in its exact and succinct statements. It is not wished to imply that chemists should avoid mathematical because they are such even though they may deal with chemical theory, but it is nevertheless a fact that the mathematical training in many of our colleges (we speak of special courses in chemistry) has been pushed to the wall. There is a reason for this, a doubtful one however, in the shortness of the collegiate course which necessarily prevents more than an introductory knowledge of chemistry even when this subject is taken alone. The main difficulty rests in the confusion of college and university and in the effort to complete one's education in the four years following the "high school" graduation.

The authors aim to present the subject to students, not as a mass of facts and recipes, but as a science which while it may be as yet more or less imperfect is already far advanced in definite form. This is particularly the purpose of the first part of the book, which deals

with generalities and seeks to separate facts from principles acquired by hypothetical speculations as well as to define precisely the meaning of terms employed. A methodical and rapid presentment is made of the laws of combination, of chemical equivalence, the atomic theory, of crystallographic laws, and of thermo-chemistry. It is shown that the atomic theory, a beautiful structure in itself, might still be done away with without in any degree undermining the laws of chemical equivalents. Great pains have been taken with the second part of the book, which deals with the metalloids as is evidenced in the exactness of the facts recorded. Original memoirs have in each case been consulted and when there has been doubt or contradiction the authors have verified their decision by actual experiment. So also with those portions treating of industrial chemical processes, modern and practical usage have alone been given passing over former processes in a few words as of historic interest only. This is a relief from the custom of many authors who through lamentable ignorance deceive the student with descriptions of processes as impossible as they are false. In short the features of the work are, an eminently successful departure from accepted notions of chemical text-books, a suppression of old and hoary errors which have descended through these same text-books from our ancestors to the present day, new methods of treatment and new illustrations. Some of the French scientific periodicals have predicted for the "Lecons de Chimie" "a place among the classics which will be as lasting as it is well merited" and such praise we feel confident will be accorded by all who peruse the work. CHARLES PLATT.

NOTES AND NEWS.

ACCORDING to the State Board of Health of Michigan, the statistics of sickness have demonstrated the law that generally influenza (la grippe) is quantitatively related to the atmospheric ozone—the more ozone the more influenza; and the law that remittent fever is inversely related—the more ozone the less remittent fever. The unusual amount of ozone, the increase of influenza and the falling off of remittent fever shown in the State Board of Health Bulletin for the week ending November 18 illustrate these general laws.

—Bulletin No. 48 of the National Museum contains the collected writings upon Myriapods by the late Chas. H. Bollman. The volume is edited by Dr. Underwood, who also contributes an excellent list of the literature of the N. A. species. The writings of Mr. Bollman are given in their order as published in Entomologica Americana, Proc. of United States National Museum, and other publications, and include also many articles which were ready for the printer at the time of Mr. Bollman's death. These latter will be especially valuable to the student of N. A. Myriapods, as they include articles upon the "Classification of the Myriapoda" and a catalogue of the N. A. species. Mr. Bollman described sixty-five species new to N. A., nearly all of which will stand, and when we consider that he was not yet twenty-one years of age at the time of his death we can but regret that he was not spared for further work. The volume just published by the Museum is by far the best work on N. A. Myriapods that has appeared since Wood's paper in 1865.

EXCHANGES.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

For Sale.—A very fine telescope, length extended, twenty-five inches, closed, seven inches. Power twenty-five times. Good as new. Cost $25.00. Will sell for the best cash offer. B. S. Bowdish, Box 165, Phelps, N. Y.

For Sale or Exchange for last editions of Standard Works on Vegetable Anatomy or Physiology: Practical Zoology, Marshall & Hurst; Elements of Embryology, Foster & Balfour; Zoology, Macalister; Guide to the Study of Insects, Packard; Geological Studies and shall We Teach Geology, Winchell. Also have duplicates of Experiment Station publications which would like to exchange for any not in my file. L. R. Jones, Burlington, Vt.

For exchange.—Skins of Aegialites nivosa, Ereunetes occidentalis, Aunnodramus Aridingi. A. rostratus, Chamara fasciata henshawi, etc., for native or foreign skins with full data. Send lists. A. W. Anthony, 2043 Albatross st., San Diego, California.

I have a Beck New National monocular microscope, accessories, microtome, mounting material and a large number of fine slides. Will exchange the whole or in part for a first class type-writer or photograph outfit. A. C. Gruhlke, Waterloo, Ind.

Offered sidebloom eggs of Bulimus oblongus and exotic land and freshwater shells in exchange for Helices not in collection. Send lists to G. K. Gude, 5 Greabach Road, upper Holloway, London, England.

Would like to exchange 100 specimens of Canadian Indian Relics for a photo outfit. E. J. Waters, 33 Hoffman St., Auburn, N. Y.

Wants.

A GEOLOGIST thoroughly conversant with the geology of the Southern States desires an engagement. Has complete knowledge of the economic geology of Iron, Coal, Lignite, as well as Clay and Kaolin. Five years' experience with Geological Surveys. Address K., 509 West Sixth Street, Austin, Texas.

WANTED.—Tuckerman's Geneva Lichenum and Carpenter on the Microscope, Wiley's Introduction to the Study of Lichens. State price and other particulars. Richard Lees, Brampton, Ont.

WANTED.—Icones Muscorum by W. D. Sullivant, with or without Supplement, but both preferred. Address, stating price and condition of books, Dr. G. N. Best, Rosemont, N. J.

WANTED.—A copy of Mascart & Joubert's Lessons in Electricity and Magnetism, Vol. I. Address R. W. Clawson, Vanderbilt University, Nashville, Tennessee.

CHEMIST.—Graduate of a polytechnical school, and studied photographic chemistry in Germany and Austria. Situation teaching or in analytical or experimental laboratory. M. B. Punnett, Rochester, N. Y.

WANTED.—A recent college graduate to assist in editorial work on Science. Those seeking large emoluments need not apply. N. D. C. Hodges, 874 Broadway, New York.

SOME OF THE NEW BOOKS AT LOW PRICES.

FAMOUS VOYAGERS AND EXPLORERS.—$1.50.

MRS. BOLTON has added to her *Famous* series of books another and an unusually interesting volume, "Famous Voyagers and Explorers." It is hardly comprehensive, as it gives the biographies of only a few typical explorers—Marco Polo, Columbus, Magellan, Raleigh, and the more prominent of our modern American explorers. Doubtless such names as the Cabots, Sir Humphrey Gilbert, De Soto, Cartier, Nansen and others are reserved for a second volume. Mrs. Bolton has a gift for this sort of writing, and she has here brought together a large amount of deeply interesting matter which otherwise could only be obtained by reading through a dozen or more separate volumes. The book is illustrated with several portraits.—*Boston Transcript.*

OUR GREAT WEST.—$2.50.

THE contents of the volume appeared serially in *Harper's Magazine* and *Harper's Weekly*, in which periodicals they attracted wide attention and favorable comment. Their importance fully justified their republication in a more permanent form. The book affords a more minute insight into the present condition of the West than can be found elsewhere. What it tells is the result of personal experience, fortified by information obtained from the best-informed and most reliable men in the localities under discussion, and set forth with admirable clearness and impartiality. It is a work to be read and pondered by those interested in the growth of the nation westward, and is of permanent standard value.—*Boston Gazette.*

STATESMEN.—$2.00.

IN the preparation of this work Noah Brooks has aimed to present a series of character sketches of the eminent persons selected for portraiture. The object is to place before the present generation of Americans salient points in the careers of public men whose attainments in statesmanship were the result of their own individual exertions and force of character rather than of fortunate circumstances. Therefore these brief studies are not biographies. Mr. Brooks had the good fortune of personal acquaintance with most of the statesmen of the latter part of the period illustrated by his pen, and he considers it an advantage to his readers that they may thus receive from him some of the impressions which these conspicuous personages made upon the mental vision of those who heard and saw them while they were living examples of nobility of aim and success of achievement in American statesmanship.

MEN OF BUSINESS.—$2.00.

W. O. STODDARD, who has just written a book published by the Scribners, on "Men of Business," tells how the late Senator Stanford chopped his way to the law. "He had grown tall and strong," says Mr. Stoddard, "and was a capital hand in a hay-field, behind a plough, or with an axe in the timber; but how could this help him into his chosen profession? Nevertheless, it was a feat of wood-chopping which raised him to the bar. When he was eighteen years of age his father purchased a tract of woodland; wished to clear it, but had not the means to do so. At the same time he was anxious to give his son a lift. He told Leland, therefore, that he could have all he could make from the timber, if he would leave the land clear of trees. Leland took the offer, for a new market had latterly been created for cord-wood. He had saved money enough to hire other choppers to help him, and he chopped for the law and his future career. Over 2,000 cords of wood were cut and sold to the Mohawk and Hudson River Railroad, and the net profit to the young contractor was $2,600. It had been earned by severe toil, in cold and heat, and it stood for something more than dollars.—*Brooklyn Times.*

ORTHOMETRY.—$2.00.

IN "Orthometry" Mr. R. F. Brewer has attempted a fuller treatment of the art of versification than is to be found in the popular treatises on that subject. While the preface shows a tendency to encourage verse-making, as unnecessary as it is undesirable, the work may be regarded as useful so far as it tends to cultivate an intelligent taste for good poetry. The rhyming dictionary at the end is a new feature, which will undoubtedly commend itself to those having a use for such aids. A specially interesting chapter is that on "Poetic Trifles," in which are included the various imitations of foreign verse in Englisb. The discussion of the sonnet, too, though failing to bring out fully the spiritual nature of this difficult verse form, is more accurate than might be expected from the following sentence: "The form of the sonnet is of Italian origin, and came into use in the fifteenth [*sic*] century, towards the end of which its construction was perfected, and its utmost melodious sweetness attained in the verse of Petrarch and Dante." In the chapter on Alliteration there are several misleading statements, such as calling "Piers the Plowman" an "Old English" poem. In the bibliography one is surprised not to find Mr. F. B. Gummere's admirable "Handbook of Poetics," now in its third edition. In spite of these and other shortcomings, which can be readily corrected in a later issue, this work may be recommended as a satisfactory treatment of the mechanics of verse. A careful reading will improve the critical faculties.—*The Dial.*